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Tradition and Technology

Adapting to New Mapping Tools in Archeology

In today's world, the use of Global Positioning Systems (GPS) and Geographic Information Systems (GIS) is becoming commonplace. These technologies, once used almost exclusively by scientists and engineers, are becoming more available for public use. We see GPS touted in car commercials where drivers confidently navigate to new locations. On the ocean, fishermen use on-board GPS units to navigate ships. Public health and safety workers use GPS to measure shifts in buildings after earthquakes and other natural disasters, and forestry and agriculture workers map boundaries of farms in an effort to settle boundary disputes. All of these applications have some, albeit indirect, affect on our daily lives.

GPS and GIS are making it possible for researchers and technicians to be more efficient, and produce more accurate information. GPS and GIS have immensely altered the manner in which data is collected in the field of archeology. In the last several decades, archeologists have increasingly used GPS and GIS as analytical tools. GIS has proven to be very useful for creating historic base maps, analyzing spatial and temporal changes, and as a tool for graphically analyzing database information.[1] GPS has become an extremely useful device for archeologists collecting field data such as site and artifact location and density.

In Hawaii, archeologists have been using GPS and GIS since the late 1980s. The trend was led by the State Historic Preservation Division, which is developing a statewide inventory of historic sites for the islands. In the 1990s, private contract archeology firms, as well as federal agencies, also began to use these tools to collect and analyze field data. Much of the GPS information that is collected today consists of locational designations, gathered as either point or line data. Generally, points refer to a single site or artifact location. Line data will often be collected for linear features such as trails or walls. Additional data such as who owns the land, site condition, and other details may also be gathered and recorded at this time if the GPS unit has data logger capabilities.

Once the locational data is collected, most archeologists revert to traditional methods of site and feature mapping in order to make some assessment of site size, type, and layout. The tools used to record this information include tape and compass, plane table, and transit. The result is a planimetric map that shows the individual features of the site, including detailed aspects of structures. In Hawaii, for example, the remnants of a pre-European contact house site may consist of walls, built of stacked basalt boulders with cobble fill, in a rectangular shape. Hawaiian archeologists not only map the interior and exterior dimensions of the house structure, but will also draw in each surficial rock used in construction of the feature. Recording at this level of detail is important because this data can help archeologists understand stylistic and temporal change in architectural features.[2]

Following a method adapted for a survey of agricultural and associated features in the North Kohala District on the island of Hawaii,[3] archeologists at Hawaii Volcanoes National Park have expanded the use of GPS and GIS technology to include the detailed planimetric mapping of archeological sites. The technique consists of a three-step mapping method. First, the interior and exterior of architectural structures are mapped with a Trimble TSC1 GPS unit as a line feature. The data is then taken back to the office, downloaded into Pathfinder ver. 2.10 and corrected with base station files to obtain the most accurate locational data available.

Once the data is corrected, it is then downloaded as a shape file into ArcView ver. 3.2. The result is an outline, or sketch of the archeological site. Figure 1 represents the outline drawing of Site HV-30, located in Hawaii Volcanoes

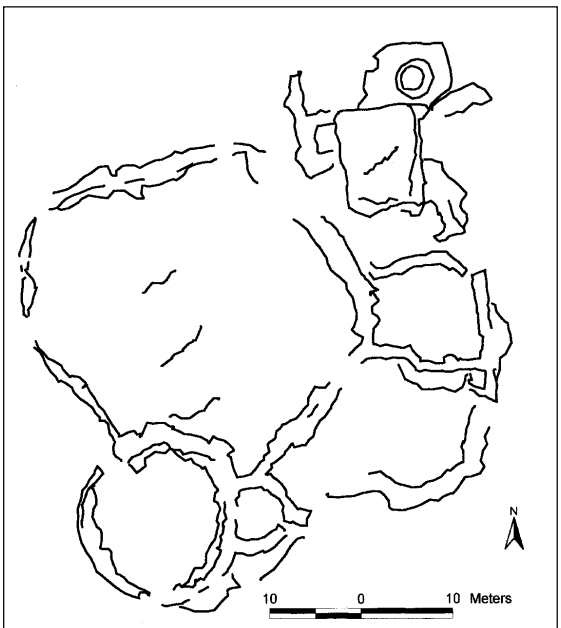

Figure 1. Planimetric View of Site HV-30 Prior to Detailed Mapping.

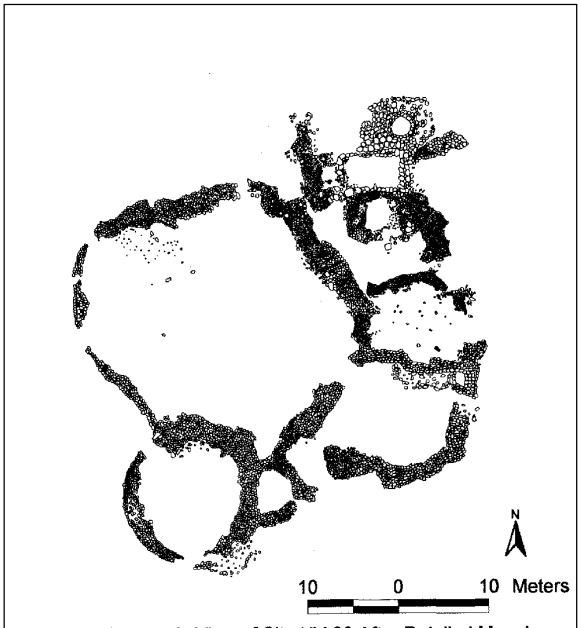

Figure 2. Planimetric View of Site HV-30 After Detailed Mapping.

National Park. Site HV-30 is a multi-terraced habitation complex. This site has both historic and pre-contact components including a historic cistern, two pre-contact habitation platforms, and numerous terraces and enclosures.

The preliminary sketch map is printed on graph paper, to scale, and taken back to the field for detailed mapping. In the field all the archeologist has left to do is fill in the detailed portions of the site including building construction and feature location. Because the outline of the site is to scale, much time is saved carrying out bulky equipment. In addition, accuracy is increased by using GPS instead of tape and compass. The result is a highly detailed, accurate and relatively quick planimetric map (see figure 2).

Taking this methodology one step further, the completed field map is scanned into a computer. The image is then registered into ArcView and symbols representing artifacts and other features are added. The result is a TIFF, or image file that can be displayed in a GIS system according to its geographically referenced location. The TIFF file can be digitized into one large shape (.shp) file or used as multiple image files. These maps can have multiple uses. First, they are easily reproduced for project reports and publications. Second, site maps can be assessed either on an individual basis, or on a regional scale where the data can be spatially and temporally evaluated.

Adapting traditional uses of GPS and GIS for archeology has allowed cultural resource managers at Hawaii Volcanoes National Park to increase the amount of land surveyed in the park at a faster and more efficient rate. This method has aided the expansion of the inventory of historic properties by over 200 features in the first eight months of the year 2000 alone. The GIS-based inventory of historic properties is increasingly becoming an important tool used by park resource managers in making historic preservation decisions.

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